

IN THE CLAIMS

Claim 1-6. (canceled)

Claim 7. **(currently amended)** An electrode comprising
a mediator, said mediator comprising a quinone molecule derivative,

a crosslinking agent, and

a polymer or a biopolymer,

wherein

**the quinone molecule derivative is a quinone molecule modified with
at least one functional group bonded with (i) the polymer or the biopolymer or (ii)
the crosslinking agent;**

the mediator is immobilized **through bonding of the at least one
modified functional group of the quinone molecule derivative;** and

the mediator mediates electron transfer between at least one enzyme and
an electrode.

Claim 8. (previously presented) An electrode according to claim 7, wherein the
at least one enzyme is immobilized.

Claim 9. (previously presented) An electrode according to claim 8, wherein the
at least one immobilized enzyme is diaphorase.

Claim 10. **(previously presented, rejoined)** An electrode according to claim 8
comprising at least two immobilized enzymes, wherein the at least two immobilized
enzymes are diaphorase and dehydrogenase.

Claim 11. **(original, rejoined)** An electrode according to claim 10, wherein the
dehydrogenase is glucose dehydrogenase.

Claim 12. **(previously presented, rejoined)** An electrode according to claim 10 or 11, further comprising immobilized co-enzyme NADH.

Claim 13. (original) An electrode according to claim 8 comprising the mediator and the enzyme immobilized on the electrode by a polymer and a crosslinking agent.

Claim 14. (original) An electrode according to claim 13, wherein the polymer is polyvinylimidazole.

Claim 15. (original) An electrode according to claim 13 or 14, wherein the crosslinking agent is polyethylene glycol diglycidyl ether (PEGDGE).

Claim 16. (canceled)

Claim 17. (original) An electrode according to claim 7, used for one of a biofuel cell and a biosensor.

Claim 18-21. (canceled)

Claim 22 (previously presented) The electrode according to claim 7 wherein the quinone molecule derivative is a naphthoquinone molecule derivative.

Claim 23. (previously presented) The electrode according to claim 22 wherein the naphthoquinone molecule derivative is at least one naphthoquinone molecule chosen from the group consisting of a sodium anthraquinone-2-sulfonate (AQS) derivative and a 2-methyl-1,4-naphthoquinone (VK3) derivative.

Claim 24. (previously presented) The electrode according to claim 22, wherein the naphthoquinone molecule derivative is a 2-methyl-1,4-naphthoquinone (VK3) derivative.

Claim 25. (previously presented) The electrode according to claim 24, wherein the 2-methyl-1,4-naphthoquinone (VK3) derivative is 2-methyl-1,4-naphthoquinone (VK3) modified with at least one functional group, wherein the at least one functional group is capable of bonding with a polymer or an enzyme.

Claim 26. (previously presented) The electrode according to claim 25, wherein the at least one functional group is selected from the group consisting of an amino group, a carboxyl group, a chloroformyl group, a succinimide oxycarbonyl group, an alkyl metal sulfosuccinimide oxycarbonyl group, a pentafluorophenyl oxycarbonyl group, a p-nitrophenyl oxycarbonyl group, a hydroxyl group, a formyl group, a halogen group, a maleimide group, an isothiocyanate group, and an oxiranyl group.

Claim 27. (previously presented) The electrode according to claim 26, wherein the 2-methyl-1,4-naphthoquinone (VK3) derivative is modified with the at least one functional group at a 2-position and/or a 3-position of the naphthoquinone.

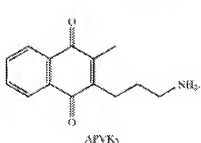
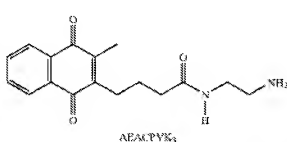
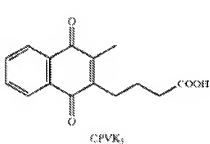
Claim 28. (previously presented) The electrode according to claim 27, wherein the 2-methyl-1,4-naphthoquinone (VK3) derivative is a 3-methyl-1,4-naphthoquinone modified with the at least one functional group at the 2-position of the naphthoquinone.

Claim 29. (previously presented) The electrode according to claim 28, further comprised of a spacer molecule between the functional group and the 2-position of the naphthoquinone.

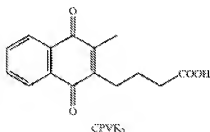
Claim 30. (previously presented) The electrode according to claim 29, wherein the spacer molecule is selected from the group consisting of a hydrocarbon linear chain, a polyoxyethylene linear chain, a polyethylene glycol chain, and a polypropylene glycol chain.

Claim 31. (previously presented) The electrode according to claim 30, wherein the spacer molecule is a hydrocarbon linear chain alkyl group.

Claim 32. (previously presented) The electrode according to claim 25, wherein the 2-methyl-1,4-naphthoquinone (VK3) derivative is one or more kinds of a quinone molecule selected from the group consisting of 2-(3-carboxypropyl)-3-methyl-1,4-naphthoquinone (CPVK3) represented by the following formula (1), 2-[3-[N-(2-aminoethyl)aminocarbonyl]propyl]-3-methyl-1,4-naphthoquinone (AEACPVK3) represented by the following formula (2), and 2-(3-aminopropyl)-3-methyl-1,4-naphthoquinone (APVK3) represented by the following formula (3):



Claim 33. (previously presented) The electrode according to claim 32, wherein the 2-methyl-1,4-naphthoquinone (VK3) derivative is 2-(3-carboxypropyl)-3-methyl-1,4-naphthoquinone (CPVK3) represented by the following formula (1):



Claim 34. (canceled)

Claim 35. (new) An electrode according to claim 7 comprising a polymer,
wherein
the modified functional group of the quinone molecule
derivative of the mediator is bonded to the crosslinking agent; and
the crosslinking agent is bonded to the polymer.

Claim 36. (new) An electrode according to claim 35, wherein
the quinone molecule derivative is a quinone molecule modified with
an amino functional group;
the polymer comprises an imidazole functional group;
the crosslinking agent comprises at least two epoxy functional
group;
the amino functional group of the quinone molecule derivative bonds
with a first epoxy functional group of the crosslinking agent;
the imidazole functional group of the polymer bonds with the second
epoxy functional group of the crosslinking agent;
the bonded mediator, crosslinking agent, and polymer form an
insoluble gel; and

the insoluble gel is immobilized on the electrode.

Claim 37. (new) An electrode according to claim 35, wherein the polymer is polyvinylimidazole.

Claim 38. (new) An electrode according to claim 35, wherein the crosslinking agent is polyethylene glycol diglycidyl ether (PEGDGE).

Claim 39. (new) An electrode apparatus comprising
an electrode with an electrode surface;
a mediator comprising a quinone molecule derivative consisting of 2-
(3-carboxypropyl)-3-methyl-1,4-naphthoquinone (CPVK3);
a diaphorase enzyme; and
a nicotinamide adenine dinucleotide molecule;
wherein
the mediator and the diaphorase enzyme are immobilized on
the electrode surface by a polyvinylimidazole polymer and a polyethylene glycol
diglycidyl ether (PEGDGE) crosslinking agent;
the immobilized diaphorase enzyme can catalyze electron
transfer between the immobilized nicotinamide adenine dinucleotide molecule
and the immobilized mediator; and
the immobilized mediator mediates electron transfer between
the immobilized diaphorase enzyme and the electrode.

Claim 40. (new) The electrode of claim 39 further comprising a
dehydrogenase enzyme,
wherein
the dehydrogenase enzyme is immobilized on the electrode
surface by the polyvinylimidazole polymer and the PEGDGE crosslinking agent;

the immobilized dehydrogenase enzyme can catalyze electron transfer between a biofuel and an oxidized form of the immobilized nicotinamide adenine dinucleotide molecule to form a reduced form of the immobilized nicotinamide adenine dinucleotide molecule; and

the immobilized diaphorase enzyme can catalyze electron transfer between the reduced form of the immobilized nicotinamide adenine dinucleotide molecule and the immobilized mediator.